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Exam Setting and Moderation in a Transnational Engineering Programme

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Abstract—The practice of writing effective exam questions has attracted plenty of interest in the literature. However, the process of exam setting and moderation has received little attention. Thus, the aim of this manuscript is to describe our approach in exam setting and moderation for a transnational education (TNE) programme between the University of Glasgow and the University of Electronic Science and Technology of China (UESTC). Each year, Glasgow University staff members prepare main and resit exam papers for 32 courses in the electronic and electrical engineering subject group. To ensure a smooth workflow and a relatively quick turnover of high-quality exam papers each year, we describe the best practices in exam setting, as well as our approach in exam moderation using a new moderation form and a new system for uploading exam papers online. This new system was designed to facilitate a solid dialogue between exam setters and examiners, so that all summative assessments are fair, consistent and reliable. These best practices can be used by engineering faculty to make informed decisions regarding the process of exam setting and moderation in a transnational engineering programme.

Keywords— *Engineering Education, Transnational Education, Assessment Methods.*

I. INTRODUCTION

Transnational education involves the delivery of educational services in another host country. The UK has established such programmes in almost 120 countries [1]. The practice of writing effective exam questions has received plenty of interest in the literature, since it is one of the methods used to determine how well students have grasped the learning outcomes of a course [2]. However, the process in which these questions are combined to form an examination paper to undergraduate engineering students has not received similar attention [3]. Consequently, the aim of this manuscript is to present our efforts in developing and delivering fair, valid and reliable exam papers to undergraduate engineering students. This is especially important, since multiple examiners are now involved in the preparation and delivery of a course, who are often accustomed to writing questions in their own style and format.

According to the literature, the font, question layout and exam format can strongly influence a candidate's performance [4, 5]. Consequently, a standardised exam format and style of questions to suit a particular academic level are needed. Moreover, moderation is also essential to ensure consistent marking between multiple examiners.

Therefore, in addition to a standardised template and moderations form, an online platform for uploading exam papers that facilitates a solid dialogue between setters and examiners is required.

In the following sections, we describe the assessment methods commonly used in Glasgow University's TNE programme with the University of Electronic Science and Technology of China (UESTC). We also describe the best practices communicated to staff when designing exam questions. Next, we provide screenshots from our newly developed exam database. Finally, we provide concluding remarks and areas for further investigation in the last section.

II. CONTEXT

A transnational education programme was established between the University of Glasgow and UESTC in 2016. This partnership resulted in the formation of the Glasgow College UESTC programme, which delivers three electronic and electrical engineering degree disciplines. These disciplines are in microelectronics, communications and information engineering. There are approximately 1200 students enrolled in these disciplines and there are 32 courses delivered by Glasgow staff in four different years of study. Courses delivered in the programme have a varied mix of assessments, as can be verified from the course specifications sheets [6]. The three forms of assessments most often used in this TNE programme are formative, summative and interim assessments, as explained below [7]:

1. Summative assessments count towards a student's final grade. It usually takes place at the end of a particular learning objective to judge how well a student has grasped the material.
2. Formative assessments take place during a student's learning process. Any marks given to the student are indicative and do not contribute to their final grade. Formative assessments provide feedback to students, so that they have an opportunity to improve their grades.
3. Interim assessments evaluate student performance at particular intervals within the learning process. They can be summative assessments that track student learning.

Examples of the most common types of assessments used by staff members are shown in Table I. However, 22 of these courses have a final exam that weighs 75% of the course grade, as shown from the list of courses in Table II. Therefore, to prepare exam scripts, staff were encouraged to produce questions that follow Bloom's revised taxonomy [8]. Common types of assessment used in the Glasgow College-UESTC programme.

TABLE I. TYPES OF ASSESSMENTS USED IN THE PROGRAMME.

Assessment Types	What is expected from the student?
Laboratory Report	Students are required to write a report for a laboratory exercise.
Oral Presentation	Students are asked to deliver either a presentation on a particular topic for a specified length of time.
Live Demonstration	Students are expected to show how a piece of software or an assembled project works.
Dialogue	Students are engaged in a dialogue.
Short Essay	Students write a short extract explaining a concept or theory.
Mid Term Exam	Students complete a set of exam type questions to test their understanding of the course materials. Such an assessment can either be summative or formative.
Final Exam	Students are expected to complete questions in a specified length of time to measure their understanding of the course materials.
Research Project	Students are required to complete a major project about a particular topic, either individually or in a team.

TABLE II. COURSES DELIVERED IN GLASGOW COLLEGE UESTC.

Course Code	Course Name	Exam %
1005	Programming	60
1008	Microelectronic Systems	75
1017	English	30
1018	English for Engineering A	30
1019	English for Engineering B	30
2004	Embedded Processors	75
2022	Circuit Analysis	75
2023	Engineering Career Skills	40
2029	English Communication	40
3001	Dynamics & Control	75
3002	Electronic Devices	75
3003	Electronic System Design	75
3005	Power Engineering	75
3010	Team Design & Project Skills	0
3018	Comm. Principles & Systems	75
3020	Digital Circuit Design	75
3022	Power Electronics	75
3029	Communication Circuit Design	75
3030	Engineering & Law	75
3031	Project Management & Finance	75
4003	Control	75
4004	Digital Communications	75
4007	VLSI Design	75
4014	Cyber Security	80
4015	DSP for Communications	80
4016	Microwave Circuit Design	70
4019	Real Time Computing Systems	75
4020	Wireless Sensor Networks	75
4024	Wireless & Optical Transmission	75
4028	Advanced Digital Comms.	75
4029	Advanced Devices	75
4033	Design of Integrated Circuits	75

As previously mentioned in the literature, verbs should be used as an indicator of the level of Learning Outcome (LO) being assessed [9]. For example, verbs associated with demonstrating knowledge include: 'describe', 'explain', 'identify' and 'define'. These verbs relate to remembering and understanding knowledge (i.e. Bloom levels 1 and 2), as shown in figure 1. Therefore, accreditation panels expect these verbs to be used in first and second year courses. Similarly, verbs associated with evaluation (Bloom level 5) can include: 'evaluate', 'assess', 'recommend' and 'select'. Such verbs ought to be used in fourth year engineering courses.

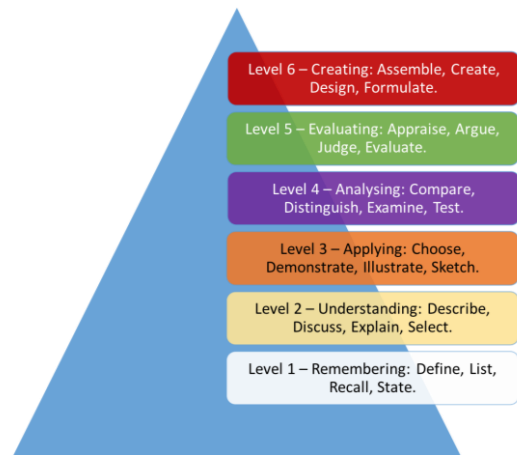


Figure 1. Staff were encouraged to develop questions that use Bloom's revised taxonomy.

The main guidelines for exam setting and moderation involved the following important steps:

1. Staff should develop a main exam paper and a resit paper. Each paper should use the Glasgow College template, which was made available on the dedicated Moodle staff page. The paper should be marked out of 100 and each question should weigh 25 marks. To help students settle into the exam, course setters were encouraged to arrange their questions according to their level of difficulty, such that they progress from easy to hard.
2. Multiple Choice Questions (MCQs) are not allowed for fourth year courses. Otherwise, MCQs must weigh less than 25% of the paper's marks and should have at least four answer options.
3. In addition to the exam files, staff should develop mark schemes for both the main and resit papers. All staff were reminded on the need for transparent marking criteria. These mark schemes ought to be understood by a non-expert in the subject. This was to ensure that the marking scheme is a useful resource for students, as well as external examiners.
4. To keep track of the moderation process, staff are also required to complete a Moderation Form. Staff should indicate the course code, title and setter name.

Consequently, there is a need to develop an online system that enables exam setters and administrators to keep track of this logistical process, especially since many engineering courses now include a larger percentage of

assessments that include the final exam [10]. An examination database therefore needs to take into account such assessments, which need to be moderated in the same way as exams. This database ought to benefit all staff in the school of engineering and should enable moderators and examiners to monitor the process of exam setting and moderation.

SECTION A: COURSE AND ASSESSMENT DETAILS: to be completed by the Course Coordinator			
Course code		Course title	
Academic year		SCQF level	Course credits
Course leader			
Please confirm that you have reviewed the Exam Assessment and Continuous Assessment Handbooks for this task.			Yes <input type="checkbox"/>
Assessment title and number			
Assessment weighting		No. of markers	
Name(s) of moderator(s)		Date assessment passed to moderator	

SECTION B: MODERATOR'S REPORT on the ASSESSMENT task			
1. Comment on the overall exam layout, difficulty of the questions and the range of marks for each question. 2. Any issues or suggestions for the marking team.			
Is the overall quality of the assessment task appropriate?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
If you have answered 'No', please indicate why. For example, if you disagreed with the setter's judgement on any aspect of the assessment task. Please provide evidence and any other details:			
Do you recommend that any of the questions should be revised?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Please indicate the recommended revisions:			
Any further comments:			
Moderator's e-signature		Date completed	
Course Coordinator Comments:			

SECTION C: MODERATOR'S REPORT on the SOLUTIONS			
Do you agree that the marks awarded are appropriate?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
If you have answered 'No', please indicate why. For example, if you disagreed with the setter's judgement on any aspect of the marks. Please provide evidence and any other details:			
Do you recommend that marks should be adjusted?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Please indicate the recommended adjustment:			
Any further comments:			
Moderator's e-signature		Date completed	
Course Coordinator Comments:			

SECTION D: EXTERNAL EXAMINER'S DECISION: to be completed by the External Examiner (if required)			
Name of External Examiner			
Do you agree to any adjustment suggested by the Moderator?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Please indicate the rationale for your decision:			
Any further comments:			
e-Signature		Date completed	
Once completed, please upload this form electronically			

Figure 2. Moderation form used to keep track of assessment progress, which is divided into four sections.

III. METHOD

To help staff with exam paper preparation, a template was developed to facilitate developing four questions, each weighing 25 marks. This standardized template was used in all courses. The current typeface used was in the template was Times New Roman and the font size was set to 12 to ensure that the text is readable. However, we will shift to a sans serif font such as Arial or Helvetica in the next semester to comply with the UK's Equality Act 2010, to ensure that the text is readable by visually impaired candidates [11].

Next, the moderation form shown in figure 2 was developed to help staff, moderators and external moderators to keep track of the process of exam preparation. The

template's rubrics, layout and structure, as well as the moderation form were discussed with other members from the college's learning and teaching committee to test them for clarity and accessibility. Staff members maintaining this moderation form will likely ensure that the concepts of exam setting, which were previously mentioned in Section II, are sustained.

Subsequently, a new exam database was developed for staff to upload and moderate exam papers. The process of exam setting and moderation is described in the flow chart shown in figure 3. The process starts with the setter submitting their main and resit papers, as well as their mark schemes. A checklist is used to determine whether the files have been uploaded. Once the material is available, internal moderators are informed that papers are ready for moderation. If the papers are approved without comments, they are then passed to the external examiner for approval. Otherwise, the moderator comments are appended to the moderation form and the exam setter is required to update the papers subject to these comments. Once the internal and external moderator comments are addressed, the papers are ready for registry.

During this process, a series of alerts and to do items are made. For example, an email is sent to administrators one day before and one day after the deadlines to catchup with late staff submissions.

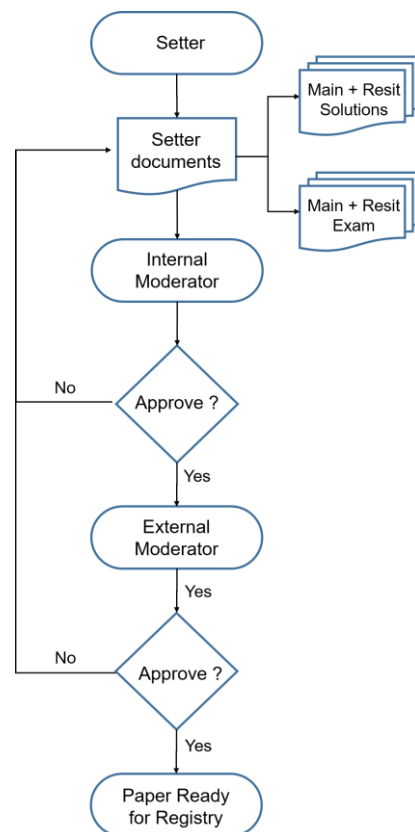


Figure 3. Flow chart describing the exam setting and moderation process

IV. RESULTS & DISCUSSIONS

Screenshots from new online exam platform are shown in Figure 4. The new platform allows staff to upload main and

moderation form and a new online system for staff to upload their exam papers. To further extend this work, we intend to develop online surveys to obtain feedback from staff members and administrators. This will help us identify areas for further improvement.

(a)

ENIGMA456 Aliquid vel iste et alias vitae.

ENIG131 Ipsam vel et non peripateticus quis et nris.

ENIG1767 Quia volut et acum volutpatio nris.

ENIG2815 Ad deserunt ante volutpatibus laudantium.

ENIG4958 Quia nostrum minima consequatur molestias.

ENIG2431 Molestiae voluptatum exeat qui consequatur.

ENIG3468 Blandit impedit ut idem officia consequatur.

ENIG3302 Iste voluptatum impedit voluptatum eius.

ENIG3871 Ipsam quia aut explicabo eius.

ENIG4478 Peripateticus quia reiciendis impedit.

ENIG4153 Quidem non ut molestiae esse voluptatum.

ENIG4244 A provident et ut illum harum iure.

ENIG2462 Voluptatum high minus exeatmolestiae non.

ENIG2555 Sunt nobis distributio eum quam.

ENIG2480 Quia expedit nostrum laudantium.

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Note: the system will only notify other people of any changes when you update the Paper Checklist

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Pre-Internally Moderated Paper

Figure 4. Snapshots from the new exam database. In (a) the setter is presented with their list of courses. By clicking on one the courses, the screen in (b) appears, which lists the main and resit exam papers. By clicking on the “Add Paper” button, the dropdown menu shown in (c) appears.

In this manuscript, we have briefly described our approach in exam setting and moderation in the Glasgow College UESTC transnational engineering programme. There are 32 courses delivered by Glasgow University staff members to approximately 1200 students in Chengdu. The majority of these course (69%) contain a final examination component that weighs 75% of the course grade. Therefore, to ensure an efficient workflow of exam setting and moderation, we have developed a standardised exam template, exam handbook,

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